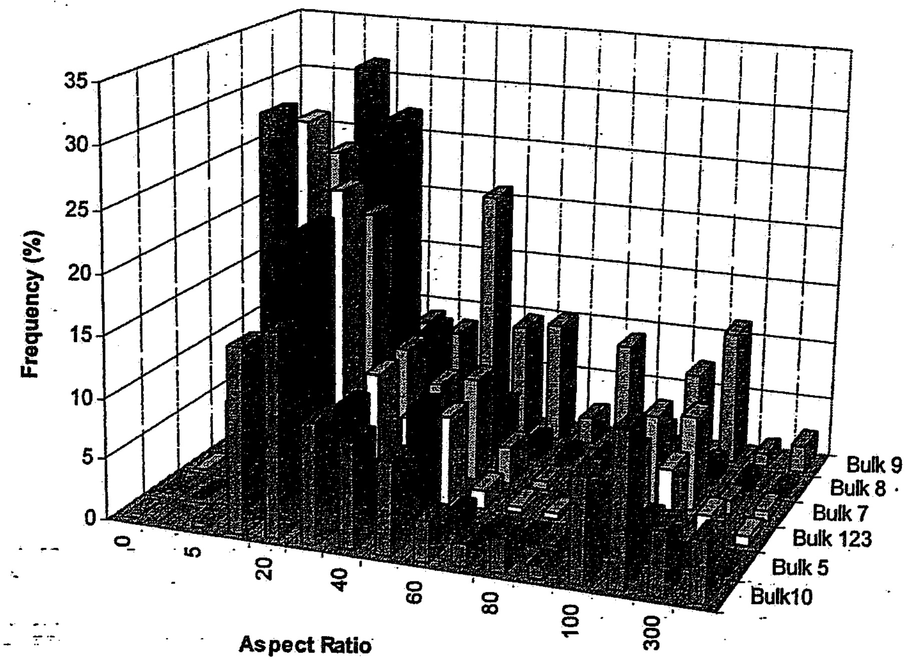
Fig 14: Summary of PCM Bulk Data



### 6.2.3 *SEM v TEM analysis of asbestos.*

Both SEM and TEM have been used for fibre sizing. Both are able to size the larger fibres and measure mass equally well but they produce different results in terms of fibre number and size distributions due to the poorer visibility of thin fibres in the SEM, the difficulty of accurately defining the edges and the effect of conductive metal coatings. A comparison of the SEM v TEM visibility and sizing of asbestos fibres has previously been carried out by HSL at X2000 and X2800 respectively. The table below summarises the results for dispersions of bulk UICC asbestos collected on the same filter. UICC asbestos is a well ground form of asbestos and should be representative of what is produced by the EU sample preparation method. The instruments used were a Cambridge 250 SEM and a Philips EM400T TEM. Table 12 shows that the SEM is not particularly good for detecting asbestos fibres compared to the TEM, at magnifications of x2000 - x3000.

Table: 12 SEM v TEM visibility and sizing of asbestos fibres.

| | Percentage of fibres with widths less than the stated dimension | | | | | |
|---|---|---|---|---|---|---|
| | UICC Chrysotile | | UICC Amosite | | UICC Crocidolite | |
| Fibre width (μm) | SEM | TEM | SEM | TEM | SEM | TEM |
| 0.2 | 1 | 18 | 1 | 10 | 0 | 18 |
| 0.4 | 2 | 75 | 6 | 60 | 12 | 90 |
| 0.6 | 33 | 92 | 53 | 84 | 63 | 99 |
| 0.8 | 74 | 98 | 81 | 95 | 88 | 100 |
| 1 | 86 | 99 | 93 | 97 | 95 | |
| 1.2 | 99 | 99 | 98 | 98 | 100 | |
| 1.5 | 100 | 100 | 99 | 99 | | |
| 2 | | | 99 | 99 | | |
| 2.5 | | | 99 | 99 | | |
| 3 | | | 100 | 99 | | |
| count | 273 | 507 | 107 | 410 | 111 | 306 |

The same fibres were also analysed at higher magnifications and the fibre counts compared in table 13.

Table 13: Comparison of SEM v TEM fibre counts in the same area at two magnifications: expressed as a percentage of the TEM count at X17,000.

| Instrument | Magnification | Chrysotile | Amosite | Crocidolite |
|---|---|---|---|---|
| SEM | 2,000 | 30 | 17.4 | too dense |
| TEM | 2,800 | 84 | 76 | too dense |
| SEM | 20,000 | 36 | 35 | 38 |
| TEM | 17,000 | 100 | 100 | 100 |
| TEM COUNT | 17,000 | 143 | 144 | 815 |

The results show that we can expect fibre counts to be 3 to 5 times higher by TEM than for SEM. As the EU has yet to decide whether fibre mass or fibre number would be used to evaluate the carcinogen content, only TEM analysis has been used for this work, so that all fibres can be seen and accurately sized.

### 6.2.4 *TEM analysis of asbestos*

Unlike the PCM/PLM data which assigned fibre to broad size bins (of 0.5 µm width and 5 µm length) the TEM was used to accurate size each fibre so a complete distribution of fibre size was obtained. As seen in figures 6-8 the fibres have size distributions which approximates to log normal and therefore geometric (log) statistics should be used to describe the distribution. The accuracy of the geometric statistics depends on whether the distribution is log-normal. Although it is possible to test for log-normality using the Chi squared test an easier assessment is to compare the median with the geometric mean. The median is a non-parametric statistic which does not assume any underlying distribution but the geometric mean assumes a log-normal distribution. If the distribution is log normal the median and geometric mean will be the same. Therefore the amount of divergence between these two statistics gives an assessment of the log normality of the distribution and the validity of the geometric statistics.

UICC asbestos samples were produced as standards for animal experiments and were subject to extensive grinding. These are thought to represent the size distributions to which asbestos will be reduced by the sample preparation method. The TEM >5 µm long fibre size distributions for bulk samples of two commercial amphibole asbestos are given in table 14. It would be expected that asbestos contaminated samples will give median widths below about 0.5 µm and median aspect ratios of around 20:1. If non-asbestos particles present an increased median width and smaller median aspect ratio will be observed.

Table 14: Size distributions of bulk UICC Amosite and Crocidolite: fibres >5 µm long.

| Material | Amosite (HSL/83034/96) | | | Crocidolite (HSL/84546/96) | | |
|---|---|---|---|---|---|---|
| | Length (µm) | Width (µm) | Aspect Ratio | Length (µm) | Width (µm) | Aspect Ratio |
| Geometric Mean | 9.98 | 0.41 | 24.09 | 8.17 | 0.33 | 24.95 |
| Geometric SD | 1.56 | 1.71 | 1.86 | 1.55 | 1.93 | 1.89 |
| Mean | 11.24 | 0.48 | 29.56 | 9.27 | 0.41 | 30.8 |
| Standard Error | 0.41 | 0.02 | 1.4 | 0.4 | 0.02 | 1.37 |
| Median | 9.18 | 0.42 | 24.61 | 7.17 | 0.32 | 24.95 |
| Standard Deviation | 6.91 | 0.33 | 23.47 | 6.97 | 0.38 | 23.75 |
| Sample Variance | 47.81 | 0.11 | 550.77 | 48.57 | 0.14 | 563.98 |
| Minimum | 5.4 | 0.14 | 5.23 | 5.01 | 0.07 | 5.23 |
| Maximum | 55.28 | 3.83 | 210.2 | 87.5 | 4.59 | 258.23 |
| Sum | 3,169.16 | 136.54 | 8,335.18 | 2,790.38 | 124.89 | 9,271.08 |
| Count | 282 | 282 | 282 | 301 | 301 | 301 |

## 7. DISCRIMINANT ANALYSIS OF TEM SIZED SAMPLES.

TEM size distribution data and descriptive statistics were collected from a number of samples to determine whether they were asbestos or mineral fragment populations. The samples were ranked to see if the asbestos fibres could be discriminated from populations consisting mainly of amphibole mineral fragments. The Jamestown, Rajastan and to a large extent the Death Valley tremolites were assumed to be asbestos. Some intermediate populations are also included. Both the TEM size data for all fibre sizes (> 0.5 µm long) and also for longer (> 5 µm long) fibres were compared separately. The median value has been chosen for the size characterisation and discrimination, as it is a non-parametric statistic which does not assume any underlying distribution, nor is it influenced disproportionately by a few very large or small values. The two methods of discriminant analysis previously described in section 4.2.3 were also applied , along with other potential discriminants.

## 7.1 Aspect ratio

The aspect ratio defines the shape of a fibre and appear to be the best parameter for distinguishing between asbestos and non-asbestos fibres. The median aspect ratio (table 15) for the >5 µm long fibres does appear to be a good discriminant by itself with values of >20:1 being characteristic asbestos and <10:1 characteristic of non-asbestos. Their appears to be a discontinuity between 20:1 and 10:1 except for one sample, (tremolite DT) which was contaminated with a variety of asbestos and non-asbestos amphibole fibres so its midway position would be expected. The same analysis for fibres of all sizes did not lead to such a clear distinction with a continuous range of values being produced with a median aspect ratio of > 8:1 being indicative of an asbestos material.

## 7.2 Fibre width

As asbestos splits longitudinally into smaller fibrils, its fibre width will tend to reduce with increased grinding but this is does not occur so easily for cleavage fragments and acicular crystals. Fibre width is potentially an equally important discriminant as the aspect ratio, particularly if a standard grinding challenge is introduced to separate and release fibres (without over grinding which can destroy fibres). The samples in table 16 have been ranked by median fibre width. Again the values for all fibre sizes do not give a clear separation between the asbestos and non-asbestos samples but for the >5 µm long fibres a clear ranking and discrimination is produced with values ≤0.42 µm being asbestos with a considerable gap to 0.89 µm before the intermediate samples are encountered with the non-asbestos medians being above 1.0 µm.

## 7.3 Index of fibrosity for the aspect ratio

An aspect ratio discriminant based on the median and geometric standard deviation (Chatfield and Dillon, 1982) was applied to the data. The median is a non-parametric statistic so has an advantage in that it does not assume an underlying distribution, the geometric standard deviation gives a measure of the spread of the distribution. As can be seen in figures 11-14, the asbestos fibres have a much wider spread of aspect ratios (GSD =1.9) and in tables 11 and 14 a median value of 20 or more is commonly found. The index of fibrosity ($F_{AR}$) uses these characteristics to produce a single discriminant value by raising the median aspect ratio to the power of the geometric standard deviation. For the ground asbestos materials above a value of $20^{1.8} = 220$ is produced. Chatfield and Dillon noted that values above 50 indicated an asbestos like material for fibres of all lengths from waterborne asbestos samples.

A range of asbestos materials and non-asbestos amphibole rocks have been investigated and their size distribution measured by TEM. The value of the index of

fibrosity and relative ranking of these materials therefore gives a good indication of how successful this method for discriminant analysis will be. The results ranked by index of fibrosity ($F_{AR}$) are given in table 17. It is important to note that not all the samples have been ground to the same degree and this may affect the values and ranking obtained. Two samples were also collected by air sampling close to the source in a quarry which may make the sample appear more fibrous due to the exclusion of larger fragments. The samples which were regarded as asbestiform by SEM observation of the fibre ends (Jamestown tremolite, Death valley tremolite, Rajastan white) and the identified asbestos $F_{AR}$ around or well above 200. The value for the $F_{AR}$ appears to be higher for the >5 μm fibres compared to fibres of all sizes by a factor of about 1.5 . For a working purpose $F_{AR} = 200$ does provide an initial discriminant for asbestos materials. For all fibre sizes, amosite, was an exception and consistently gave values below 200, the lowest being 33.9. Amosite (and anthophyllite even more so) tends to have the largest fibril widths of all the asbestos materials and mean widths are often twice as large (for all fibre sizes) as for chrysotile and crocidolite. This alters the aspect ratio distribution and accounts for the lower $F_{AR}$ values. This tendency is much less pronounced for fibres >5 μm long and explains why the >5 μm fibres of amosite have a $F_{AR}$ >200. Therefore the $F_{AR}$ seems a useful discriminant if applied to the >5 μm long fibres and a value of ≥200 being indicative of an asbestos fibre population. The same discriminant is less successful using all fibre sizes but a value > 50 is still indicative of asbestos -like materials.

### 7.4 Index of fibrosity for fibre width

Applying the same logic to fibre width as aspect ratio, the spread of the width distribution is an important function to measure, although it depends on the amount of grinding. It will also give a much more direct indication of whether there is a significant population of wider non-asbestos cleavage fragments which cannot split up easily. An index for fibre width can be calculated in much the same way as for the aspect ratio but unlike aspect ratio where a broad distribution is produced, a low value for median fibre width with a relatively narrow GSD is more likely for an asbestos fibre population. Also if we want asbestos to be denoted by a high index value both the reciprocal of the fibre width and the reciprocal of the GSD must be used. It can be seen from table 18 that the index for fibre width does not alter the situation very much from the mean width and again only the >5 μm fibres are well discriminated with a value of <1 for the non-asbestos materials.

### 7.5 Regression analysis of log width data

This analysis assumes that the underlying distributions are log-normal and fits a least squares regression line to the $\log_{10}$ data of the width and lengths in the form :

Log width = F log length -b where F = the slope or index of fibrosity and b is the intercept.

The regression coeff. ($R^2$) the standard error (SE) and the lower and upper 95% confidence limits of the slope and intercept were also computed and fitted to the data.

The results are given in table 19 for all fibre sizes (>0.5 µm long) and table 20 for fibres >5 µm long. Both tables have been sorted in ascending order of slope with the more asbestiform populations giving the flattest slope. The range of values obtained from the samples studied in tables 19 and 20 are fairly continuous across the whole range of values with asbestos giving slopes of up to 0.56 suggesting that this is not a particularly good discriminant or that the range of populations is continuous and an arbitrary point has to be selected ( approximately 0.6) to decide whether it is asbestos or non-asbestos.

## 7.6 Regression analysis for Log aspect ratio data

The same regression analysis can be done for the aspect ratio. This produces a reverse order to width with the higher slopes for asbestos and has been sorted in descending order to place the more asbestiform materials at the top of the tables 21 and 22 to make the more asbestos like materials appear at the top of the table. Alternatively the tables could have been recalculated by using (1-slope of the aspect ratio regression). The same continuous distribution of values was found for width with values for asbestos decreasing down to 0.44, suggesting a cut - off point of approximately 0.4 (or 1-0.4 =0.6 the same as for the width)

## 7.7 Discriminant analysis

Discriminant analysis uses a mathematical function derived from a study of the size measurements of populations of asbestos fibres and applies this to an individual fibre to decide if it is classed as part of a population of asbestos fibres or mineral fragments. Wylie et al. (1985) who measured the length and width of particles on two groups of workplace air-monitoring filters; one from industrial sites where amosite asbestos alone was in use and one from mines where non-asbestiform amphiboles are the major constituents of the country rock. SEM measurements were made on all particles with an aspect ratio > 3:1. Discriminant function analysis was used to arrive at the function:

$$Y = 5.9 \log \text{length} - 9.2 \log \text{width} - 6.63$$

which most efficiently discriminates between two previously defined groups according to whether $Y > 0$ or $Y < 0$. The coefficients are those for which the variance of Y between the defined groups is maximised relative to the variances within the groups. 81% of the asbestos fibres had $Y > 0$ (described as Group A "fibre-like") and 91% of the cleavage fragments had $Y < 0$ (described as Group B "cleavage-like"),

TABLE: 15 Size data ranked by median aspect ratio.

| Sample Number | Type | Count | Median AR | GSD AR | Fibrosity index | Median Width | GSD | 1/Width Fibrosity |
|---|---|---|---|---|---|---|---|---|
| HSL/82077/95 | Jamestown tremolite | 304 | 24.25 | 2.42 | 2,243.89 | 0.23 | 1.9 | 16.32 |
| HSL/82073/95 | Death Valley tremolite 'hard' | 336 | 17.55 | 1.91 | 238 | 0.22 | 1.72 | 13.96 |
| HSL/82403/95 | Tremolite asbestos | 304 | 15.92 | 1.92 | 203.11 | 0.22 | 1.73 | 13.73 |
| HSL/83159/95 | Rajastan white (Anthophyllite + Talc) | 279 | 15.07 | 2.26 | 459.77 | 0.35 | 1.82 | 6.75 |
| HSL/82074/95 | Tremolite DT | 153 | 13.94 | 2.51 | 744.9 | 0.52 | 2.28 | 4.44 |
| HSL/82309/95G1 | Amosite | 301 | 10.59 | 2.05 | 126.19 | 0.31 | 1.97 | 10.37 |
| HSL/84544/96 | Gabbro Germany | 167 | 10.41 | 1.82 | 71.08 | 0.21 | 2.15 | 28.66 |
| AMOS1 | Amosite from site | 201 | 10.23 | 1.87 | 77.35 | 0.29 | 1.67 | 8.06 |
| HSL/82197/95 | Chrysotile | 316 | 10.15 | 2.74 | 572.42 | 0.08 | 1.8 | 94.28 |
| HSL/82539/96 | Amosite (bulk 7) | 289 | 10.1 | 1.96 | 93 | 0.27 | 1.82 | 10.84 |
| HSL/82309/95G2 | Amosite | 84 | 9.36 | 1.67 | 41.88 | 0.35 | 1.56 | 5.12 |
| HSL/82720/95 | Tremolite in dolomite | 154 | 8.2 | 2.54 | 209.45 | 0.22 | 2.89 | 79.51 |
| HSL/82323/95G | NY Talc (Bulk 1,2,3) | 300 | 7.94 | 1.79 | 41.14 | 0.66 | 1.94 | 2.24 |
| HSL/82323/95 | NY Talc (Bulk 1,2,3) | 342 | 7.26 | 1.74 | 31.36 | 0.3 | 2.17 | 13.83 |
| HSL/82191/95 | Amosite (bulk 8) | 310 | 7.24 | 1.78 | 33.91 | 0.26 | 1.8 | 11.46 |
| HSL/82761/95 | Tremolite in dolomite | 298 | 6.89 | 2.11 | 58.7 | 0.18 | 2.92 | 149.49 |
| HSL/83059/96 | Tremolite (Edenitic) Drumnadrochit | 321 | 6.87 | 1.61 | 22.35 | 0.22 | 1.79 | 15.13 |
| HSL/84545/96 | Diabase Germany | 102 | 6.4 | 1.51 | 16.34 | 0.33 | 1.99 | 9.29 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| HSL/82077/95 (> 5µm long) | Jamestown tremolite | 313 | 44.15 | 2.12 | 3,070.81 | 0.26 | 1.94 | 13.64 |
| HSL/82073/95 (>5 um long) | Death Valley tremolite 'hard' | 308 | 31.29 | 1.9 | 693.86 | 0.29 | 1.73 | 8.77 |
| HSL/82072/95 (>5 um long) | Rajastan white (Anthophyllite + Talc) | 186 | 27.74 | 2.28 | 1,951.11 | 0.37 | 1.7 | 5.42 |
| HSL/84546/96 (>5 µm long) | UICC Crocidolite bulk | 301 | 24.95 | 1.89 | 436.98 | 0.33 | 1.93 | 8.5 |
| HSL/83034/96 (>5 µm long) | UICC Amosite | 282 | 24.61 | 1.86 | 386.78 | 0.42 | 1.71 | 4.41 |
| HSL/82191/95 (> 5µm long) | Amosite (bulk 8) | 101 | 20.04 | 1.94 | 335.49 | 0.41 | 1.96 | 5.74 |
| HSL/82074/95 (> 5µm long) | Tremolite DT | 107 | 15.9 | 2.18 | 415.95 | 0.99 | 2.23 | 1.02 |
| HSL/82323/95 (>5 um long) | NY Talc (Bulk 1,2,3) | 61 | 8.61 | 2.02 | 77.39 | 0.89 | 2.05 | 1.27 |
| HSL/82761/95 (>5 µm long) | Tremolite in dolomite | 100 | 8.52 | 2.74 | 354.33 | 1.01 | 2.81 | 0.97 |
| HSL/81001/95 (>5 um long) | Tremolite in dolomite | 103 | 7.29 | 2.11 | 66.12 | 1.15 | 2.29 | 0.73 |
| HSL/82720/95 (>5 um long) | Tremolite in dolomite | 206 | 7.19 | 2.8 | 250.52 | 1.02 | 3.02 | 0.94 |
| HSL/83093/96 (> 5µm long) | Carr Brae tremolite | 311 | 6.6 | 1.83 | 31.31 | 1.18 | 2 | 0.72 |
| HSL/81068/95 (>5 um long) | Tremolite in dolomite | 302 | 6.5 | 1.95 | 38.48 | 1.31 | 2.22 | 0.55 |
| HSL/83092/96 (> 5µm long) | Auchtertyre Actinolite | 309 | 6.28 | 1.77 | 25.85 | 1.28 | 2 | 0.62 |
| HSL/81068/95 (>5 um long) | Tremolite in dolomite | 98 | 6.28 | 1.92 | 34.05 | 1.37 | 2.16 | 0.51 |
| HSL/81001/95 (>5 um long) | Non-asbestos dolomite | 77 | 5.5 | 1.99 | 29.64 | 1.2 | 2.18 | 0.67 |
| HSL/83094/96 (> 5µm long) | Glenelg grunerite | 302 | 5.46 | 1.77 | 20.07 | 1.32 | 1.8 | 0.61 |
| HSL/82761/95 (>5 µm long) | Dolomite particles only | 48 | 4.26 | 1.42 | 7.83 | 1.5 | 1.6 | 0.52 |

TABLE 16: Size data ranked by median width.

| Sample Number | Type | Count | Median AR | GSD AR | Fibrosity index | Median Width | GSD | 1/Width Fibrosity |
|---|---|---|---|---|---|---|---|---|
| HSL/82197/95 | Chrysotile | 316 | 10.15 | 2.74 | 572.42 | 0.08 | 1.8 | 94.28 |
| HSL/82761/95 | Tremolite in dolomite | 298 | 6.89 | 2.11 | 58.7 | 0.18 | 2.92 | 149.49 |
| HSL/84544/96 | Gabbro Germany | 167 | 10.41 | 1.82 | 71.08 | 0.21 | 2.15 | 28.66 |
| HSL/82073/95 | Death Valley tremolite 'hard' | 336 | 17.55 | 1.91 | 238 | 0.22 | 1.72 | 13.96 |
| HSL/82403/95 | Tremolite asbestos | 304 | 15.92 | 1.92 | 203.11 | 0.22 | 1.73 | 13.73 |
| HSL/82720/95 | Tremolite in dolomite | 154 | 8.2 | 2.54 | 209.45 | 0.22 | 2.89 | 79.51 |
| HSL/83059/96 | Tremolite (Edenitic) Drumnadrochit | 321 | 6.87 | 1.61 | 22.35 | 0.22 | 1.79 | 15.13 |
| HSL/82077/95 | Jamestown tremolite | 304 | 24.25 | 2.42 | 2,243.89 | 0.23 | 1.9 | 16.32 |
| HSL/82191/95 | Amosite (bulk 8) | 310 | 7.24 | 1.78 | 33.91 | 0.26 | 1.8 | 11.46 |
| HSL/82539/96 | Amosite (bulk 7) | 289 | 10.1 | 1.96 | 93 | 0.27 | 1.82 | 10.84 |
| AMOS1 | Amosite from site | 201 | 10.23 | 1.87 | 77.35 | 0.29 | 1.67 | 8.06 |
| HSL/82323/95 | NY Talc (Bulk 1,2,3) | 342 | 7.26 | 1.74 | 31.36 | 0.3 | 2.17 | 13.83 |
| HSL/82309/95G1 | Amosite | 301 | 10.59 | 2.05 | 126.19 | 0.31 | 1.97 | 10.37 |
| HSL/84545/96 | Diabase Germany | 102 | 6.4 | 1.51 | 16.34 | 0.33 | 1.99 | 9.29 |
| HSL/82309/95G2 | Amosite | 84 | 9.36 | 1.67 | 41.88 | 0.35 | 1.56 | 5.12 |
| HSL/83159/95 | Rajastan white (Anthophyllite + Talc) | 279 | 15.07 | 2.26 | 459.77 | 0.35 | 1.82 | 6.75 |
| HSL/82074/95 | Tremolite DT | 153 | 13.94 | 2.51 | 744.9 | 0.52 | 2.28 | 4.44 |
| HSL/82323/95G | NY Talc (Bulk 1,2,3) | 300 | 7.94 | 1.79 | 41.14 | 0.66 | 1.94 | 2.24 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| HSL/82077/95 (> 5μm long) | Jamestown tremolite | 313 | 44.15 | 2.12 | 3,070.81 | 0.26 | 1.94 | 13.64 |
| HSL/82073/95 (>5 um long) | Death Valley tremolite 'hard' | 308 | 31.29 | 1.9 | 693.86 | 0.29 | 1.73 | 8.77 |
| HSL/84546/96 (>5 μm long) | UICC Crocidolite bulk | 301 | 24.95 | 1.89 | 436.98 | 0.33 | 1.93 | 8.5 |
| HSL/82072/95 (>5 um long) | Rajastan white (Anthophyllite + Talc) | 186 | 27.74 | 2.28 | 1,951.11 | 0.37 | 1.7 | 5.42 |
| HSL/82191/95 (> 5μm long) | Amosite (bulk 8) | 101 | 20.04 | 1.94 | 335.49 | 0.41 | 1.96 | 5.74 |
| HSL/83034/96 (>5 μm long) | UICC Amosite | 282 | 24.61 | 1.86 | 386.78 | 0.42 | 1.71 | 4.41 |
| HSL/82323/95 (>5 um long) | NY Talc (Bulk 1,2,3) | 61 | 8.61 | 2.02 | 77.39 | 0.89 | 2.05 | 1.27 |
| HSL/82074/95 (> 5μm long) | Tremolite DT | 107 | 15.9 | 2.18 | 415.95 | 0.99 | 2.23 | 1.02 |
| HSL/82761/95 (>5 μm long) | Tremolite in dolomite | 100 | 8.52 | 2.74 | 354.33 | 1.01 | 2.81 | 0.97 |
| HSL/82720/95 (>5 um long) | Tremolite in dolomite | 206 | 7.19 | 2.8 | 250.52 | 1.02 | 3.02 | 0.94 |
| HSL/81001/95 (>5 um long) | Tremolite in dolomite | 103 | 7.29 | 2.11 | 66.12 | 1.15 | 2.29 | 0.73 |
| HSL/83093/96 (> 5μm long) | Carr Brae tremolite | 311 | 6.6 | 1.83 | 31.31 | 1.18 | 2 | 0.72 |
| HSL/81001/95 (>5 um long) | Non-asbestos dolomite | 77 | 5.5 | 1.99 | 29.64 | 1.2 | 2.18 | 0.67 |
| HSL/83092/96 (> 5μm long) | Auchtertyre Actinolite | 309 | 6.28 | 1.77 | 25.85 | 1.28 | 2 | 0.62 |
| HSL/81068/95 (>5 um long) | Tremolite in dolomite | 302 | 6.5 | 1.95 | 38.48 | 1.31 | 2.22 | 0.55 |
| HSL/83094/96 (> 5μm long) | Glenelg grunerite | 302 | 5.46 | 1.77 | 20.07 | 1.32 | 1.8 | 0.61 |
| HSL/81068/95 (>5 um long) | Tremolite in dolomite | 98 | 6.28 | 1.92 | 34.05 | 1.37 | 2.16 | 0.51 |
| HSL/82761/95 (>5 μm long) | Dolomite particles only | 48 | 4.26 | 1.42 | 7.83 | 1.5 | 1.6 | 0.52 |

TABLE 17: Size data ordered by the index of fibrosity ($F_{AR}$) for aspect ratio.

| Sample Number | Type | Count | Median AR | GSD AR | Fibrosity index | Median Width | GSD | 1/Width Fibrosity |
|---|---|---|---|---|---|---|---|---|
| HSL/82077/95 | Jamestown tremolite | 304 | 24.25 | 2.42 | 2,243.89 | 0.23 | 1.9 | 16.32 |
| HSL/82074/95 | Tremolite DT | 153 | 13.94 | 2.51 | 744.9 | 0.52 | 2.28 | 4.44 |
| HSL/82197/95 | Chrysotile | 316 | 10.15 | 2.74 | 572.42 | 0.08 | 1.8 | 94.28 |
| HSL/83159/95 | Rajastan white (Anthophyllite + Talc) | 279 | 15.07 | 2.26 | 459.77 | 0.35 | 1.82 | 6.75 |
| HSL/82073/95 | Death Valley tremolite 'hard' | 336 | 17.55 | 1.91 | 238 | 0.22 | 1.72 | 13.96 |
| HSL/82720/95 | Tremolite in dolomite | 154 | 8.2 | 2.54 | 209.45 | 0.22 | 2.89 | 79.51 |
| HSL/82403/95 | Tremolite asbestos | 304 | 15.92 | 1.92 | 203.11 | 0.22 | 1.73 | 13.73 |
| HSL/82309/95G1 | Amosite | 301 | 10.59 | 2.05 | 126.19 | 0.31 | 1.97 | 10.37 |
| HSL/82539/96 | Amosite (bulk 7) | 289 | 10.1 | 1.96 | 93 | 0.27 | 1.82 | 10.84 |
| AMOS1 | Amosite from site | 201 | 10.23 | 1.87 | 77.35 | 0.29 | 1.67 | 8.06 |
| HSL/84544/96 | Gabbro Germany | 167 | 10.41 | 1.82 | 71.08 | 0.21 | 2.15 | 28.66 |
| HSL/82761/95 | Tremolite in dolomite | 298 | 6.89 | 2.11 | 58.7 | 0.18 | 2.92 | 149.49 |
| HSL/82309/95G2 | Amosite | 84 | 9.36 | 1.67 | 41.88 | 0.35 | 1.56 | 5.12 |
| HSL/82323/95G | NY Talc (Bulk 1,2,3) | 300 | 7.94 | 1.79 | 41.14 | 0.66 | 1.94 | 2.24 |
| HSL/82191/95 | Amosite (bulk 8) | 310 | 7.24 | 1.78 | 33.91 | 0.26 | 1.8 | 11.46 |
| HSL/82323/95 | NY Talc (Bulk 1,2,3) | 342 | 7.26 | 1.74 | 31.36 | 0.3 | 2.17 | 13.83 |
| HSL/83059/96 | Tremolite (Edenitic) Drumnadrochit | 321 | 6.87 | 1.61 | 22.35 | 0.22 | 1.79 | 15.13 |
| HSL/84545/96 | Diabase Germany | 102 | 6.4 | 1.51 | 16.34 | 0.33 | 1.99 | 9.29 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| HSL/82077/95 (> 5µm long) | Jamestown tremolite | 313 | 44.15 | 2.12 | 3,070.81 | 0.26 | 1.94 | 13.64 |
| HSL/82072/95 (>5 um long) | Rajastan white (Anthophyllite + Talc) | 186 | 27.74 | 2.28 | 1,951.11 | 0.37 | 1.7 | 5.42 |
| HSL/82073/95 (>5 um long) | Death Valley tremolite 'hard' | 308 | 31.29 | 1.9 | 693.86 | 0.29 | 1.73 | 8.77 |
| HSL/84546/96 (>5 µm long) | UICC Crocidolite bulk | 301 | 24.95 | 1.89 | 436.98 | 0.33 | 1.93 | 8.5 |
| HSL/82074/95 (> 5µm long) | Tremolite DT | 107 | 15.9 | 2.18 | 415.95 | 0.99 | 2.23 | 1.02 |
| HSL/83034/96 (>5 µm long) | UICC Amosite | 282 | 24.61 | 1.86 | 386.78 | 0.42 | 1.71 | 4.41 |
| HSL/82761/95 (>5 µm long) | Tremolite in dolomite | 100 | 8.52 | 2.74 | 354.33 | 1.01 | 2.81 | 0.97 |
| HSL/82191/95 (> 5µm long) | Amosite (bulk 8) | 101 | 20.04 | 1.94 | 335.49 | 0.41 | 1.96 | 5.74 |
| HSL/82720/95 (>5 um long) | Tremolite in dolomite | 206 | 7.19 | 2.8 | 250.52 | 1.02 | 3.02 | 0.94 |
| HSL/82323/95 (>5 um long) | NY Talc (Bulk 1,2,3) | 61 | 8.61 | 2.02 | 77.39 | 0.89 | 2.05 | 1.27 |
| HSL/81001/95 (>5 um long) | Tremolite in dolomite | 103 | 7.29 | 2.11 | 66.12 | 1.15 | 2.29 | 0.73 |
| HSL/81068/95 (>5 um long) | Tremolite in dolomite | 302 | 6.5 | 1.95 | 38.48 | 1.31 | 2.22 | 0.55 |
| HSL/81068/95 (>5 um long) | Tremolite in dolomite | 98 | 6.28 | 1.92 | 34.05 | 1.37 | 2.16 | 0.51 |
| HSL/83093/96 (> 5µm long) | Carr Brae tremolite | 311 | 6.6 | 1.83 | 31.31 | 1.18 | 2 | 0.72 |
| HSL/81001/95 (>5 um long) | Non-asbestos dolomite | 77 | 5.5 | 1.99 | 29.64 | 1.2 | 2.18 | 0.67 |
| HSL/83092/96 (> 5µm long) | Auchtertyre Actinolite | 309 | 6.28 | 1.77 | 25.85 | 1.28 | 2 | 0.62 |
| HSL/83094/96 (> 5µm long) | Glenelg grunerite | 302 | 5.46 | 1.77 | 20.07 | 1.32 | 1.8 | 0.61 |
| HSL/82761/95 (>5 µm long) | Dolomite particles only | 48 | 4.26 | 1.42 | 7.83 | 1.5 | 1.6 | 0.52 |

TABLE 18: Size data ordered by the 1/width fibrosity

| Sample Number | Type | Count | Median AR | GSD AR | Fibrosity index | Median Width | GSD | 1/Width Fibrosity |
|---|---|---|---|---|---|---|---|---|
| HSL/82761/95 | Tremolite in dolomite | 298 | 6.89 | 2.11 | 58.7 | 0.18 | 2.92 | 149.49 |
| HSL/82197/95 | Chrysotile | 316 | 10.15 | 2.74 | 572.42 | 0.08 | 1.8 | 94.28 |
| HSL/82720/95 | Tremolite in dolomite | 154 | 8.2 | 2.54 | 209.45 | 0.22 | 2.89 | 79.51 |
| HSL/84544/96 | Gabbro Germany | 167 | 10.41 | 1.82 | 71.08 | 0.21 | 2.15 | 28.66 |
| HSL/82077/95 | Jamestown tremolite | 304 | 24.25 | 2.42 | 2,243.89 | 0.23 | 1.9 | 16.32 |
| HSL/83059/96 | Tremolite (Edenitic) Drumnadrochit | 321 | 6.87 | 1.61 | 22.35 | 0.22 | 1.79 | 15.13 |
| HSL/82073/95 | Death Valley tremolite 'hard' | 336 | 17.55 | 1.91 | 238 | 0.22 | 1.72 | 13.96 |
| HSL/82323/95 | NY Talc (Bulk 1,2,3) | 342 | 7.26 | 1.74 | 31.36 | 0.3 | 2.17 | 13.83 |
| HSL/82403/95 | Tremolite asbestos | 304 | 15.92 | 1.92 | 203.11 | 0.22 | 1.73 | 13.73 |
| HSL/82191/95 | Amosite (bulk 8) | 310 | 7.24 | 1.78 | 33.91 | 0.26 | 1.8 | 11.46 |
| HSL/82539/96 | Amosite (bulk 7) | 289 | 10.1 | 1.96 | 93 | 0.27 | 1.82 | 10.84 |
| HSL/82309/95G1 | Amosite | 301 | 10.59 | 2.05 | 126.19 | 0.31 | 1.97 | 10.37 |
| HSL/84545/96 | Diabase Germany | 102 | 6.4 | 1.51 | 16.34 | 0.33 | 1.99 | 9.29 |
| AMOS1 | Amosite from site | 201 | 10.23 | 1.87 | 77.35 | 0.29 | 1.67 | 8.06 |
| HSL/83159/95 | Rajastan white (Anthophyllite + Talc) | 279 | 15.07 | 2.26 | 459.77 | 0.35 | 1.82 | 6.75 |
| HSL/82309/95G2 | Amosite | 84 | 9.36 | 1.67 | 41.88 | 0.35 | 1.56 | 5.12 |
| HSL/82074/95 | Tremolite DT | 153 | 13.94 | 2.51 | 744.9 | 0.52 | 2.28 | 4.44 |
| HSL/82323/95G | NY Talc (Bulk 1,2,3) | 300 | 7.94 | 1.79 | 41.14 | 0.66 | 1.94 | 2.24 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HSL/82077/95 (> 5μm long) | Jamestown tremolite | 313 | 44.15 | 2.12 | 3,070.81 | 0.26 | 1.94 | 13.64 |
| HSL/82073/95 (>5 um long) | Death Valley tremolite 'hard' | 308 | 31.29 | 1.9 | 693.86 | 0.29 | 1.73 | 8.77 |
| HSL/84546/96 (>5 μm long) | UICC Crocidolite bulk | 301 | 24.95 | 1.89 | 436.98 | 0.33 | 1.93 | 8.5 |
| HSL/82191/95 (> 5μm long) | Amosite (bulk 8) | 101 | 20.04 | 1.94 | 335.49 | 0.41 | 1.96 | 5.74 |
| HSL/82072/95 (>5 um long) | Rajastan white (Anthophyllite + Talc) | 186 | 27.74 | 2.28 | 1,951.11 | 0.37 | 1.7 | 5.42 |
| HSL/83034/96 (>5 μm long) | UICC Amosite | 282 | 24.61 | 1.86 | 386.78 | 0.42 | 1.71 | 4.41 |
| HSL/82323/95 (>5 um long) | NY Talc (Bulk 1,2,3) | 61 | 8.61 | 2.02 | 77.39 | 0.89 | 2.05 | 1.27 |
| HSL/82074/95 (> 5μm long) | Tremolite DT | 107 | 15.9 | 2.18 | 415.95 | 0.99 | 2.23 | 1.02 |
| HSL/82761/95 (>5 μm long) | Tremolite in dolomite | 100 | 8.52 | 2.74 | 354.33 | 1.01 | 2.81 | 0.97 |
| HSL/82720/95 (>5 um long) | Tremolite in dolomite | 206 | 7.19 | 2.8 | 250.52 | 1.02 | 3.02 | 0.94 |
| HSL/81001/95 (>5 um long) | Tremolite in dolomite | 103 | 7.29 | 2.11 | 66.12 | 1.15 | 2.29 | 0.73 |
| HSL/83093/96 (> 5μm long) | Carr Brae tremolite | 311 | 6.6 | 1.83 | 31.31 | 1.18 | 2 | 0.72 |
| HSL/81001/95 (>5 um long) | Non-asbestos dolomite | 77 | 5.5 | 1.99 | 29.64 | 1.2 | 2.18 | 0.67 |
| HSL/83092/96 (> 5μm long) | Auchtertyre Actinolite | 309 | 6.28 | 1.77 | 25.85 | 1.28 | 2 | 0.62 |
| HSL/83094/96 (> 5μm long) | Glenelg grunerite | 302 | 5.46 | 1.77 | 20.07 | 1.32 | 1.8 | 0.61 |
| HSL/81068/95 (>5 um long) | Tremolite in dolomite | 302 | 6.5 | 1.95 | 38.48 | 1.31 | 2.22 | 0.55 |
| HSL/82761/95 (>5 μm long) | Dolomite particles only | 48 | 4.26 | 1.42 | 7.83 | 1.5 | 1.6 | 0.52 |
| HSL/81068/95 (>5 um long) | Tremolite in dolomite | 98 | 6.28 | 1.92 | 34.05 | 1.37 | 2.16 | 0.51 |

Table 19: Regression analysis of the slope of log length v log width sorted ascending (All fibres >0.5 µm long)

| | | | | | | | 95% conf. interval for slope &intercept | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | Type | Count | Slope | Intercept | R2 | SE | Lower | Upper | Lower | Upper |
| AMOS 1 | Amosite site sample | 201 | -0.22 | 0.89 | 0.03 | 0.27 | -0.39 | -0.05 | 0.79 | 0.99 |
| HSL/82539/95 | Chrysotile | 316 | 0.07 | -1.08 | 0.01 | 0.25 | 0 | 0.15 | -1.12 | -1.04 |
| HSL/82077/95 | Jamestown tremolite | 304 | 0.26 | -0.84 | 0.13 | 0.26 | 0.19 | 0.34 | -0.9 | -0.77 |
| HSL/83159/95 | Rajastan white (Anthophyllite + Talc) | 279 | 0.29 | -0.7 | 0.17 | 0.24 | 0.22 | 0.37 | -0.76 | -0.63 |
| HSL/82073/95 | Death Valley tremolite | 279 | 0.29 | -0.7 | 0.17 | 0.24 | 0.22 | 0.37 | -0.76 | -0.63 |
| HSL/82403/95 | Tremolite asbestos | 304 | 0.36 | -0.86 | 0.18 | 0.22 | 0.27 | 0.44 | -0.91 | -0.8 |
| HSL/82309/95TG | Amosite | 85 | 0.4 | -0.67 | 0.3 | 0.16 | 0.27 | 0.53 | -0.75 | -0.59 |
| HSL/82309/95G1 | Amosite | 303 | 0.41 | -0.77 | 0.11 | 0.28 | 0.28 | 0.55 | -0.85 | -0.7 |
| HSL/82539/96 | Amosite (bulk 7) | 289 | 0.43 | -0.76 | 0.33 | 0.21 | 0.36 | 0.5 | -0.81 | -0.72 |
| HSL/82074/95 | Tremolite DT | 153 | 0.49 | -0.74 | 0.32 | 0.3 | 0.38 | 0.6 | -0.86 | -0.62 |
| HSL/82191/95 | Amosite | 310 | 0.55 | -0.76 | 0.38 | 0.21 | 0.47 | 0.63 | -0.8 | -0.73 |
| HSL/82323/95G | NY Talc | 301 | 0.64 | -0.62 | 0.33 | 0.24 | 0.54 | 0.75 | -0.69 | -0.55 |
| HSL/83059/96 | Tremolite (Edenitic) Drumnadrochit | 321 | 0.66 | -0.79 | 0.44 | 0.19 | 0.58 | 0.74 | -0.82 | -0.76 |
| HSL/84544/96 | Gabbro Germany (air) | 167 | 0.74 | -0.93 | 0.44 | 0.25 | 0.61 | 0.88 | -1 | -0.87 |
| HSL/82720/95 | Tremolite in dolomite | 154 | 0.77 | -0.92 | 0.25 | 0.4 | 0.54 | 0.93 | -1.03 | -0.82 |
| HSL/82323/95 | NY Talc | 342 | 0.78 | -0.81 | 0.54 | 0.23 | 0.7 | 0.86 | -0.85 | -0.77 |
| HSL/82761/95* | Tremolite in dolomite | 298 | 0.89 | -0.9 | 0.55 | 0.32 | 0.79 | 0.98 | -0.94 | -0.86 |
| HSL/84545/96 | Diabase Germany (air) | 102 | 0.9 | -0.81 | 0.66 | 0.18 | 0.77 | 1.02 | -0.87 | -0.75 |

Table 20: Regression analysis of log length v log width sorted descending (>5 µm long fibres)

| | | | | | | | 95% conf. interval for slope &intercepts | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | Type | Count | Slope | Intercept | R2 | SE | Lower | Upper | Lower | Upper |
| HSL/83034/96 (>5) | UICC Amosite | 282 | 0.25 | -0.63 | 0.04 | 0.23 | 0.11 | 0.39 | -0.78 | -0.49 |
| HSL/82072/95 (>5) | Rajastan white (Anthophyllite + Talc) | 186 | 0.29 | -0.74 | 0.07 | 0.3 | 0.13 | 0.45 | -0.91 | -0.56 |
| HSL/82073/95 (>5) | Death Valley tremolite | 308 | 0.32 | -0.86 | 0.06 | 0.23 | 0.17 | 0.47 | -1 | -0.72 |
| HSL/82077/95 (>5) | Jamestown tremolite | 313 | 0.33 | -0.93 | 0.09 | 0.28 | 0.22 | 0.45 | -1.06 | -0.81 |
| HSL/82323/95 (>5) | NY Talc (Bulk 1,2,3) | 61 | 0.55 | -0.61 | 0.08 | 0.3 | 0.08 | 1.03 | -1.04 | -0.18 |
| HSL/82074/95 (>5) | Tremolite DT | 107 | 0.56 | -0.65 | 0.14 | 0.33 | 0.29 | 0.83 | -0.96 | -0.33 |
| HSL/84546/96 (> 5) | UICC Crociolite | 301 | 0.56 | -0.99 | 0.14 | 0.27 | 0.4 | 0.72 | -1.14 | -0.85 |
| HSL/83094/96 (>5) | Glenelg grunerite | 302 | 0.6 | -0.44 | 0.1 | 0.24 | 0.4 | 0.81 | -0.62 | -0.26 |
| HSL/81001/95 (>5) | Tremolite in dolomite | 103 | 0.92 | -0.84 | 0.19 | 0.32 | 0.55 | 1.3 | -1.2 | -0.48 |
| HSL/83093/96 (>5) | Carr Brae tremolite | 311 | 0.94 | -0.81 | 0.25 | 0.26 | 0.76 | 1.12 | -0.98 | -0.65 |
| HSL/83092/96 (>5) | Auchtertyre Actinolite | 309 | 0.95 | -0.79 | 0.31 | 0.25 | 0.79 | 1.11 | -0.94 | -0.64 |
| HSL/82720/95 (>5) | Tremolite in dolomite | 206 | 1.36 | -1.34 | 0.25 | 0.44 | 1.03 | 1.69 | -1.66 | -1.03 |

Table 21: Regression analysis of log length v log aspect ratio sorted descending : All fibres (>0.5 μm long fibres)

| | | | | | | | 95% conf. interval for slope &intercepts | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | Type | Count | Slope | Intercept | R2 | SE | Lower | Upper | Lower | Upper |
| HSL/82197(539)/95 | Chrysotile | 316 | 0.93 | 1.08 | 0.66 | 0.25 | 0.85 | 1 | 1.04 | 1.12 |
| AMOS1 | Amosite site sample | 201 | 0.78 | 0.89 | 0.29 | 0.27 | 0.61 | 0.95 | 0.79 | 0.99 |
| HSL/82077/95 | Jamestown tremolite | 304 | 0.74 | 0.84 | 0.54 | 0.26 | 0.66 | 0.81 | 0.77 | 0.9 |
| HSL/83159/95 | Rajastan white (Anthophyllite + Talc) | 279 | 0.71 | 0.7 | 0.55 | 0.24 | 0.63 | 0.79 | 0.63 | 0.76 |
| HSL/82073/95 | Death Valley Tremolite | 279 | 0.71 | 0.7 | 0.55 | 0.24 | 0.63 | 0.79 | 0.63 | 0.76 |
| HSL/82403/95 | Tremolite asbestos | 304 | 0.64 | 0.86 | 0.42 | 0.21 | 0.56 | 0.73 | 0.8 | 0.91 |
| HSL/82309/95TG | Amosite | 85 | 0.6 | 0.67 | 0.49 | 0.16 | 0.47 | 0.74 | 0.59 | 0.75 |
| HSL/82309/95G1 | Amosite | 303 | 0.59 | 0.77 | 0.2 | 0.28 | 0.46 | 0.72 | 0.7 | 0.85 |
| HSL/82539/96 | Amosite (bulk 7) | 289 | 0.57 | 0.76 | 0.47 | 0.21 | 0.5 | 0.64 | 0.72 | 0.81 |
| HSL/82074/95 | Tremolite DT | 153 | 0.51 | 0.74 | 0.34 | 0.3 | 0.4 | 0.63 | 0.62 | 0.86 |
| HSL/82191/95 | Amosite | 310 | 0.45 | 0.76 | 0.29 | 0.21 | 0.37 | 0.53 | 0.73 | 0.8 |
| HSL/82323/95G1 | NY Talc | 301 | 0.36 | 0.62 | 0.13 | 0.24 | 0.25 | 0.46 | 0.55 | 0.69 |
| HSL/83059/96 | Tremolite (Edenitic) Drumnadrochit | 321 | 0.34 | 0.79 | 0.17 | 0.19 | 0.26 | 0.42 | 0.76 | 0.82 |
| HSL/82720/95 | Tremolite in dolomite | 154 | 0.27 | 0.92 | 0.05 | 0.4 | 0.07 | 0.46 | 0.82 | 1.03 |
| HSL/84544/96 | Gabbro Germany (air) | 167 | 0.26 | 0.93 | 0.08 | 0.25 | 0.13 | 0.39 | 0.87 | 1 |
| HSL/82323/95 | NY Talc | 342 | 0.22 | 0.81 | 0.09 | 0.23 | 0.14 | 0.3 | 0.77 | 0.85 |
| HSL/82761 | Tremolite in dolomite | 298 | 0.11 | 0.9 | 0.02 | 0.32 | 0.02 | 0.21 | 0.86 | 0.94 |
| HSL/84545/96 | Diabase Germany (air) | 102 | 0.11 | 0.81 | 0.03 | 0.18 | -0.02 | 0.24 | 0.75 | 0.87 |

Table 22: Regression analysis of log length v log aspect ratio sorted descending (>5 μm long fibres)

| Sample Number | Type | Count | Slope | Intercept | R2 | SE | L95% | U95% | L95% | U95% |
|---|---|---|---|---|---|---|---|---|---|---|
| HSL/83034/96 (> 5) | UICC amosite | 282 | 0.75 | 0.63 | 0.29 | 0.23 | 0.61 | 0.89 | 0.49 | 0.78 |
| HSL/82072/95 (>5) | Rajastan white (Anthophyllite + Talc) | 185 | 0.71 | 0.74 | 0.29 | 0.3 | 0.55 | 0.87 | 0.56 | 0.91 |
| HSL/82073/95 (>5) | Death Valley Tremolite | 308 | 0.68 | 0.86 | 0.22 | 0.23 | 0.54 | 0.83 | 0.72 | 1 |
| HSL/82077/95 (>5) | Jamestown tremolite | 313 | 0.67 | 0.93 | 0.29 | 0.28 | 0.55 | 0.79 | 0.81 | 1.06 |
| HSL/82323/95 (>5) | NY Talc (Bulk 1,2,3) | 61 | 0.45 | 0.61 | 0.06 | 0.3 | -0.03 | 0.92 | 0.18 | 1.04 |
| HSL/82074/95 (>5) | Tremolite DT | 107 | 0.44 | 0.65 | 0.09 | 0.32 | 0.17 | 0.71 | 0.33 | 0.96 |
| HSL/84546/96 >(5) | UICC Crociolite | 301 | 0.44 | 0.99 | 0.09 | 0.27 | 0.28 | 0.6 | 0.85 | 1.14 |
| HSL/83094/96 (>5) | Glenelg grunerite | 302 | 0.4 | 0.44 | 0.05 | 0.24 | 0.19 | 0.6 | 0.26 | 0.62 |
| HSL/81001/95 (>5) | Tremolite in dolomite | 103 | 0.08 | 0.84 | 0 | 0.32 | 0.48 | 1.2 | -0.3 | 0.45 |
| HSL/83093/96 (>5) | Carr Brae tremolite | 311 | 0.06 | 0.81 | 0 | 0.26 | -0.12 | 0.24 | 0.65 | 0.98 |
| HSL/83092/96 (>5) | Auchtertyre Actinolite | 309 | 0.05 | 0.79 | 0 | 0.25 | -0.11 | 0.21 | 0.64 | 0.94 |
| HSL/82720/95 (>5) | Tremolite in dolomite | 206 | -0.35 | 1.34 | 0.02 | 0.44 | -0.7 | -0.04 | 1.04 | 1.67 |

Table 23 Discriminant analysis using (Y = 5.9 log length - 9.2 log width -6.63) for > 5 μm long fibres.

| Sample Number | Type | Count | Discriminant >0 | Discriminant <0 | % asbestos | % non-asbestos |
|---|---|---|---|---|---|---|
| HSL/82073/95 (>5) | Death Valley tremolite | 308 | 301 | 7 | 97.73 | 2.27 |
| HSL/82077/95 (>5) | Jamestown tremolite | 313 | 305 | 8 | 97.44 | 2.56 |
| HSL/84546/96 (> 5) | UICC Crociolite | 301 | 276 | 25 | 91.69 | 8.31 |
| HSL/82072/95 (>5) | Rajastan white (Anthophyllite + Talc) | 186 | 166 | 20 | 89.25 | 10.75 |
| HSL/83034/96 (>5) | UICC Amosite | 282 | 251 | 31 | 89.01 | 10.99 |
| HSL/82074/95 (>5) | Tremolite DT | 107 | 69 | 38 | 64.49 | 35.51 |
| HSL/82323/95 (>5) | NY Talc (Bulk 1,2,3) | 61 | 24 | 37 | 39.34 | 60.66 |
| HSL/82720/95 (>5) | Tremolite in dolomite | 206 | 66 | 140 | 32.04 | 67.96 |
| HSL/81001/95 (>5) | Tremolite in dolomite | 103 | 27 | 76 | 26.21 | 73.79 |
| HSL/83093/96 (>5) | Carr Brae tremolite | 311 | 67 | 244 | 21.54 | 78.46 |
| HSL/83092/96 (>5) | Auchtertyre Actinolite | 309 | 49 | 260 | 15.86 | 84.14 |
| HSL/83094/96 (>5) | Glenelg grunerite | 302 | 38 | 264 | 12.58 | 87.42 |